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Hydro IN Ontario



The Hydro - Electric Power Commission of Ontario

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620 UNIVERSITY AVENUE
TORONTO, ONTARIO
1939

A Unique Electrical Service

ONTARIO'S "Hydro" undertaking is a co-operative municipal enterprise administered by The Hydro-Electric Power Commission of Ontario. It has successfully demonstrated how the development and application of power resources can be efficiently co-ordinated to the social and economic interests of a large population occupying an extensive territory.

Broadly, The Hydro-Electric Power Commission of Ontario is entrusted with the duty of supplying the electrical needs of the citizens of Ontario at the lowest possible cost consistent with sound economics. Its field is province-wide. It has been supplying electrical service for nearly thirty years, and during this period the costs of electricity to the consumer have been substantially reduced, while the finances of the enterprise have been established on a secure foundation.

Fundamentals that have been insisted upon from the beginning are: that business principles must be strictly followed in all phases of operation and of finance; and that government participation in the undertaking be limited to that degree of supervision of general policies necessary for the protection of the guarantees of the Province in connection with the enterprise.

It is of interest to note that all the power resources of the undertaking are entirely derived from water-power developments, including both the power generated in Commission-owned plants and also the power purchased for redistribution.

In the following pages are given, in brief compass, a description of the origin and growth of the organization; an outline of its administrative and financial features; a description of the Co-operative Systems administered for the municipalities, and of the Northern Ontario Properties administered for the Provincial government; a reference to the growth in load and the engineering achievements of the Commission; certain statistics relating to the cost of service to consumers in the municipalities which are partners in the undertaking; and finally a very brief summary of the service given in rural areas.

Origin and Growth

THE province of Ontario has an area of about 400,000 square miles. Its extensive agricultural areas, its vast forests and its rich mines, supply raw materials for diversified manufacturing industries of growing importance. Most of its settled population, however, is concentrated in the southern portion of the Province, being in general the area south of lake Nipissing and the Ottawa river. In this territory there is an assessed area of approximately 40,000 square miles.

At the beginning of this century it was recognized that the southern portion of Ontario was destined to become an important manufacturing area provided that some means could be taken to lessen or remove the growing dependence of the Province upon outside sources for its fuel and power supplies. It was moreover believed that with an adequate supply of power, Ontario could and would take a prominent place in world commerce, and this belief has since proved correct.

Meantime, adjacent to this power-using territory, Niagara, one of the greatest water powers in the world, was largely unutilized. Public spirited citizens applied themselves to the problem and finally, following the reports of investigating commissions, the Provincial Government in 1906 provided by special Act for the creation of The Hydro-Electric Power Commission of Ontario. In 1907 *The Power Commission Act* was passed, amplifying and extending the Act of 1906, and this Act,—modified by numerous amending Acts which now form part of the Revised Statutes of Ontario, 1937—constitutes the authority under which the Commission operates.

In 1909 work was commenced on a comprehensive transmission network and by the end of 1910 power was being supplied to several municipalities. At the end of 1938, the Commission was serving 821 municipalities in Ontario. This number included 26 cities, 102 towns, 285 villages and police villages and 408 townships.

To provide this service the Commission operates several widespread, but co-ordinated systems of generating plants and transmission networks, interconnected where advisable. All told the Commission owns and operates 46 generating stations, having a total capacity of 1,519,400 horsepower. In addition the Commission in 1938 purchased 540,005 horsepower, making a total maximum capacity of 2,059,405 horsepower, with an energy output exceeding 7,500,000,000 kilowatt-hours.



Queenston generating station below the rapids of the Niagara River. The operating head of water utilized at full load is 294 feet, and the total capacity is about 525,000 horsepower. Length of power house is 590 feet.

Service At Cost

THE basic principle governing the financial operations of the undertaking is that electrical service be given by the Commission to the municipalities and by the municipalities to the ultimate consumers *at cost*. Cost includes not only all operating and maintenance charges, interest on capital investment and reserves for renewals or depreciation, for obsolescence and contingencies and for stabilization of rates, but also a reserve for sinking fund or capital payments on debentures.

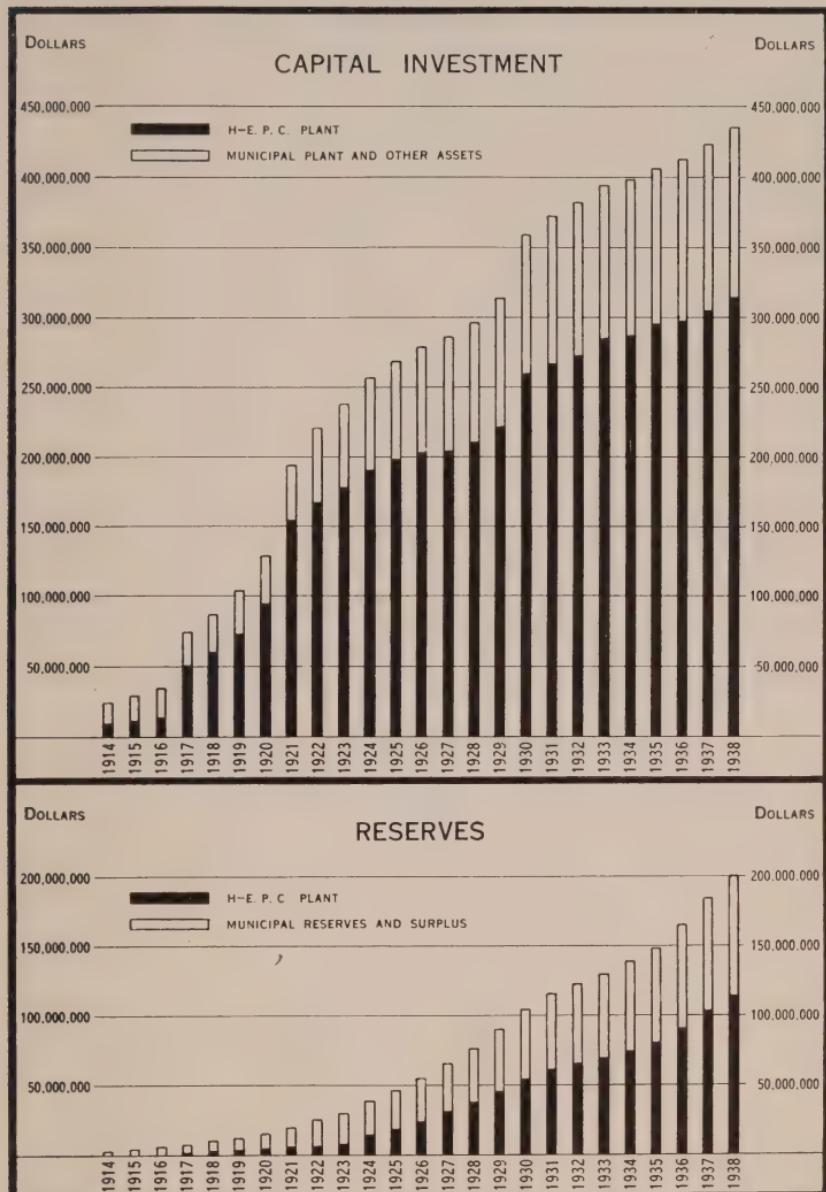
From its inception the undertaking has been entirely self-supporting and no contributions to revenues have been made from general taxes. In connection with the distribution of power in rural areas, assistance is given by the Province (see page 16).

The undertaking as a whole involves two distinct phases of operations as follows:—

The FIRST phase is the provision of the electrical power—either by generation or purchase—and its transformation, transmission and delivery in *wholesale* quantities to individual municipal utilities, to large industrial consumers, and to rural power districts. This is performed by The Hydro-Electric Power Commission of Ontario as trustee for the municipalities acting collectively in groups or "systems." Each system of municipalities, as provided in The Power Commission Act, forms an independent financial unit.

The SECOND phase is the *retail* distribution of electrical energy to consumers within the limits of the areas served by the various municipal utilities and rural power districts. In the case of rural power districts, which usually embrace portions of more than one township, The Hydro-Electric Power Commission not only provides the power at wholesale, but also—on behalf of the respective individual townships—attends to all physical and financial operations connected with the distribution of energy at retail to the consumers within the rural power districts. In the case of cities, towns, many villages and certain thickly populated areas of townships, retail distribution of electrical energy provided by the Commission is in general conducted by individual local municipal utility commissions under the general supervision of The Hydro-Electric Power Commission of Ontario.

Hydro's Financial Strength



The above charts, showing a 25-year record for all Hydro systems indicate clearly how reserves have been consistently set up, keeping pace with investments, not only for The Hydro-Electric Power Commission, but also for the municipal electrical utilities.

The Co-operative Systems

FROM time to time, in accordance with provisions in *The Power Commission Act*, various groups of municipalities have been co-ordinated to form systems for the purpose of obtaining power supplies from convenient sources. In some cases these small systems grew until their transmission lines interlocked with those of adjacent systems and it proved beneficial to consolidate the transmission networks and the financial and administrative features. In the well settled parts of the Province known as Old Ontario, this process has now reached a more stable condition and the municipalities of the southern part of the Province are now combined in three systems: the Niagara system, the Georgian Bay system and the Eastern Ontario system. One other system of partnership municipalities is known as the Thunder Bay system.

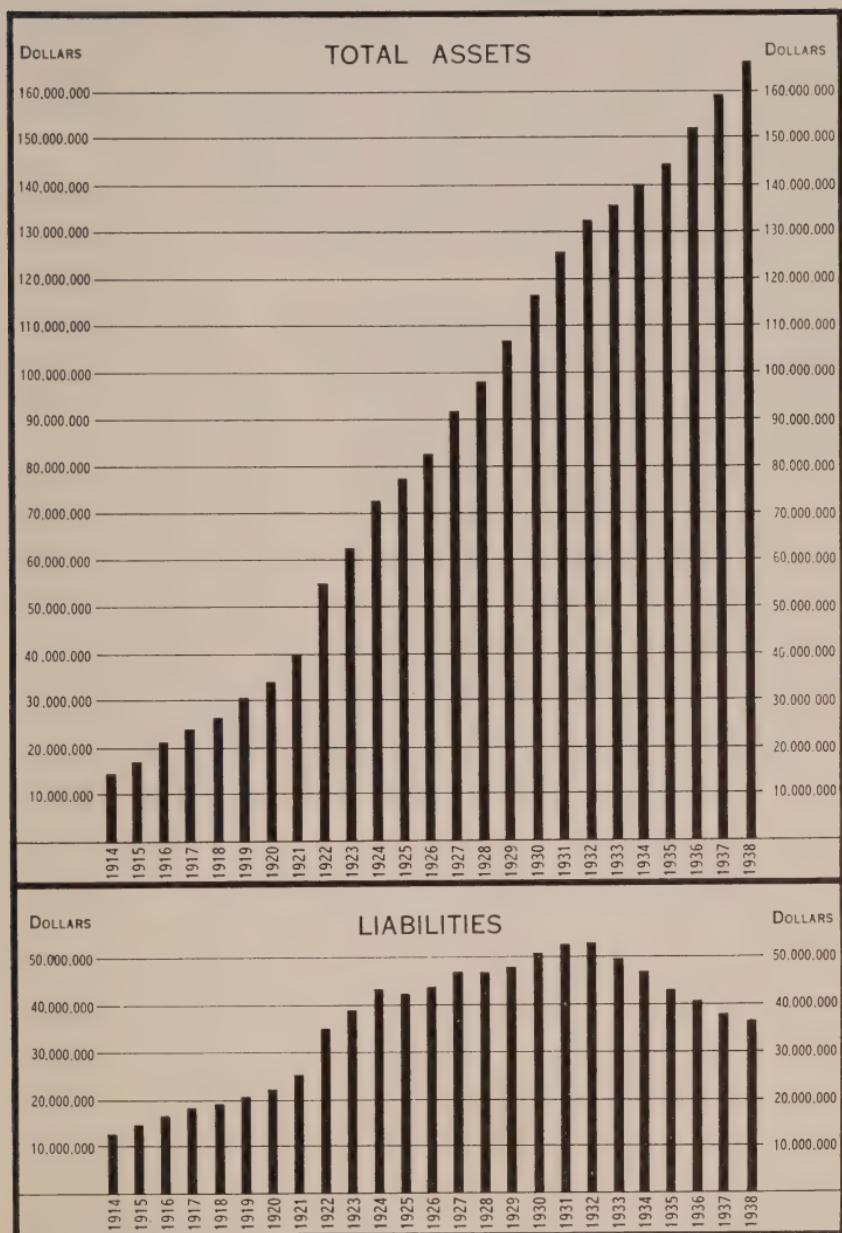
The *Niagara System* is the largest and most important system. It embraces municipalities in all the territory between Niagara Falls, Hamilton and Toronto on the east, and Windsor Sarnia and Goderich on the west. It is served with electrical energy generated at plants on the Niagara river, supplemented with power transmitted from generating plants on the Ottawa river and with power purchased from Quebec companies.

The *Georgian Bay System* which is a consolidation of four systems previously established by the Commission, comprises municipalities in that part of the Province which surrounds the southern end of Georgian bay and lies to the north of the territory served by the Niagara system. It includes the districts surrounding lake Simcoe and extends as far north as Huntsville in the Lake of Bays district and south to Port Perry. Its power supplies are derived chiefly from local water-power developments.

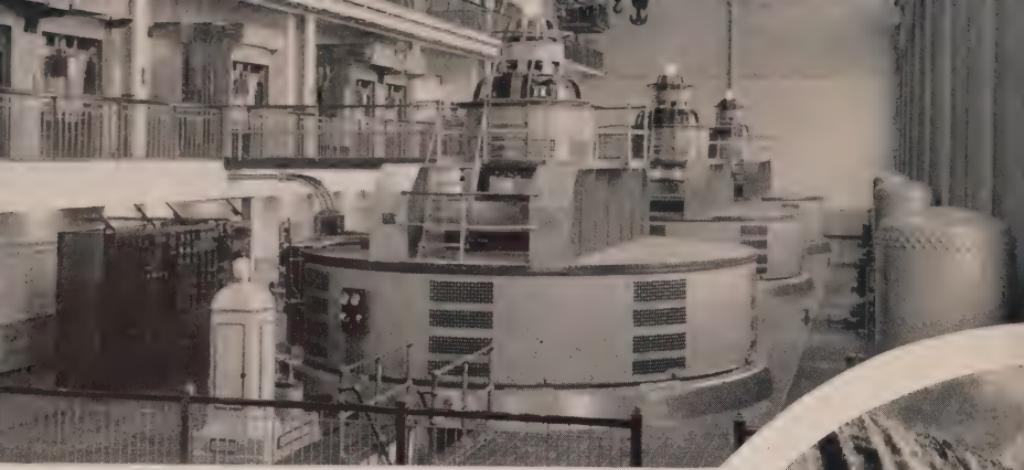
The *Eastern Ontario System* serves all of Ontario east of the areas served by the Georgian Bay and the Niagara systems. It includes the districts of Central Ontario, St. Lawrence, Rideau, Ottawa and Madawaska; formerly separate systems. Its power supplies are from local developments supplemented by purchases from other sources.

The *Thunder Bay System* comprises the cities of Port Arthur and Fort William, adjacent rural sections, the village of Nipigon, and the mining district of Longlac. Two developments on the Nipigon river supply power.

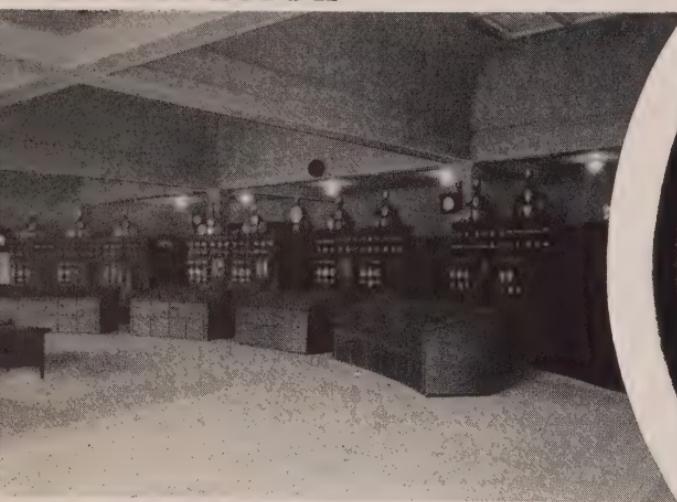
Local Ownership Prospers



A 25-year record of the assets and liabilities of Hydro utilities of co-operating urban municipalities, shows a steady increase in the ratio of assets to liabilities. The reduction in the liabilities of the locally-owned systems since 1932 is due to the regular fulfillment of debt retirement schedules.



Generation



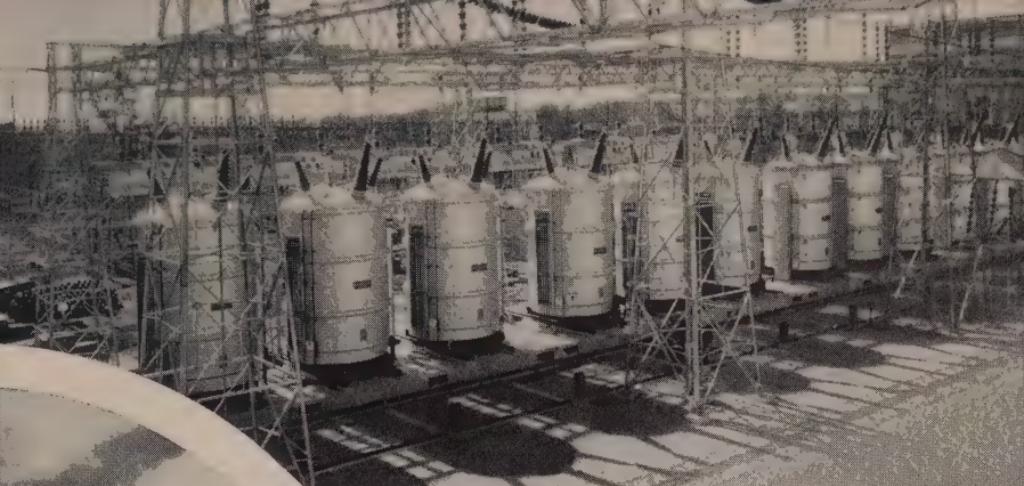
Control



Transmission

Water

From Waterpower to Consumer . . .



Transformation



Distribution



Utilization

Ontario's co-operative municipal-ownership enterprise enables energy, derived from waterpower, to be efficiently carried through various stages and delivered to the ultimate consumer as low-cost electrical service.

Northern Ontario Properties

IN ADDITION to its operations on behalf of the partner municipalities, the Commission, under an agreement with the Province, holds and operates the *Northern Ontario Properties* in trust for the Province. Although widely separated geographically, these properties for the purposes of financial administration are treated as one unit. The various divisions of the Northern Ontario Properties lie in the portion of the Province north of Lake Nipissing and French River areas, between the Manitoba and Quebec interprovincial boundaries, exclusive of the territory served by the Thunder Bay system.

The principal areas in this vast territory at present receiving service are: the *Nipissing District* centering around the city of North Bay on the shore of lake Nipissing; the *Sudbury District*, which contains the largest nickel deposits in the world, comprising the city of Sudbury and the adjacent mining area known as Sudbury Basin; the *Abitibi District* which includes the well-known Porcupine and Kirkland Lake gold mining areas and which are served by 25-cycle power from the Abitibi Canyon development over a transmission line 190 miles long, with branches to all important mining areas now being actively exploited; the *Patricia District* comprising the territory within transmission distance of the Ear Falls development at the outlet of lac Seul on the English river, including the Red Lake and Woman Lake mining areas; and *St. Joseph District* in the territorial district of Patricia serving the Pickle Lake area with power from a development at Rat Rapids on the Albany river.

Since about 1930 there has been a phenomenal growth in the mining industry of Northern Ontario. The provision of low-cost power by the Commission has made possible the development of the great ore deposits in the pre-Cambrian shield which is exposed throughout the whole of Northern Ontario. At the present time more than 50 operating mines are being served by the Commission and the rate of load increase is steadily upwards. This growing activity, particularly of the gold producers, makes necessary the constant enlargement of existing, and the construction of new, generating stations, transmission lines and transformer stations.



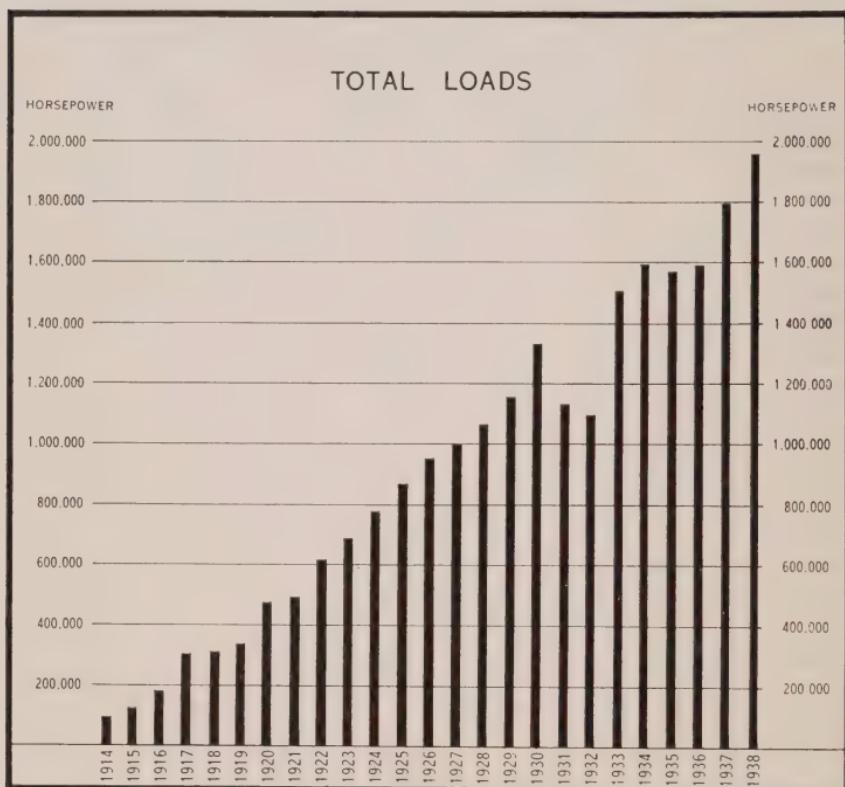
Abitibi Canyon hydro-electric development with a maximum normal plant capacity of 240,000 horsepower, provides 25-cycle power for many well-known gold mining areas and for the nickel mines in Northern Ontario.

A Quarter Century's Growth

THE Hydro enterprise was initiated by purchase of power by public tender in 1909-10 from existing companies with plants already operating at Niagara Falls and at two other points in Ontario. The small initial load of less than 1,000 horsepower in 1910 grew in five years to 100,000 horsepower in the area supplied from Niagara, and had to be supplemented from time to time by purchases from other plants.

In the meanwhile, a policy of construction of new hydro-electric plants to supply other parts of the Province, and the purchase of existing plants, was initiated as early as 1914.

Twenty-Five Years' Total Load Growth



The above diagram shows how the Commission's total load has increased over the past 25 years. It depicts conditions for the month of December which correspond closely to winter peak conditions.

Following the war a tremendous increase took place in the general use of electricity, and by 1920 the load reached 476,000 horsepower.

The Commission constructed the great Queenston-Chippawa development of 525,000 horsepower, which started to deliver power in 1922. Today, the Commission operates 46 hydro-electric developments and purchases large blocks of power to meet what appears to be an ever-increasing demand which, by the end of 1938, totalled nearly 2,000,000 horsepower.

The chart on the opposite page illustrates how the Commission's total load has increased over the past quarter century.

Engineering Achievements

IN addition to the eminence it has attained in the design and construction of hydro-electric plants, the Commission has pioneered in the art of public utility engineering in many ways. For example, the co-ordinated supply of power to many municipalities, the "superpower" idea, was early put into practice, and centralized technical supervision has contributed greatly to the success of the enterprise.

In high-voltage transmission, the Commission has operated 110,000-volt lines since 1910 and 220,000-volt lines since 1928. It contributed substantially to the design of suspension type insulators and was among the first to adopt and apply to whole transmission networks wide-scale high-speed protective methods. Much of its engineering success is due to the fact that it maintains well-equipped laboratories and fully co-operates in research work with other engineering organizations.

A prominent factor in the early success of the Commission was the employment of scientific rate schedules (tariffs). These rate schedules, based upon service at cost, provided for the use of additional energy at lower rates, and greatly stimulated the use of electricity, especially in the domestic field.

Today, with a highly experienced technical staff, the Commission is continuing to pioneer in all branches of electrical public utility practice in order to provide the best possible electrical service in Ontario at still lower cost.

Low Cost of Service

PROVIDING adequate reserves are maintained, the actual cost of service to the citizens, as represented by their monthly bills over a period of years, is the best criterion of the success or failure of an electrical undertaking in relation to the social and economic interests of the community.

Acting upon the principle of *service at cost*, the Commission early applied scientifically designed rate schedules (tariffs) which reflected in a practical manner, customer costs, demand costs and energy costs. Years before the term "promotional rate" was in general use, the Commission was employing tariffs which, because they were based upon *service at cost*, were promotional in form and equitable as between classes of service and individual consumer requirements.

These promotional rates, which encourage greater use of electricity because the average cost per kilowatt-hour to the consumer decreases with increasing use, can be made more favourable with hydro-electric plants because the cost of operation is not materially increased when the energy output of existing equipment is increased.

The early application of such rate schedules resulted in a remarkable increase in the use of electricity, especially for domestic purposes. In the year 1938 the average annual consumption per domestic consumer in Ontario urban municipalities was 1,980 kilowatt-hours.

Low average costs per kilowatt-hour are largely a function of use. This is especially true with respect to distribution costs for domestic service. Under the guidance of the Commission many of the municipal utilities of Ontario have been able to reduce the cost of distribution for domestic service until it is substantially less than one cent per kilowatt-hour.

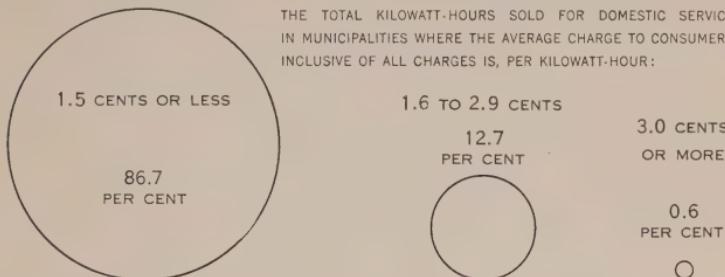
With such attractive rates the Commission believes that Ontario's citizens will continue to find still greater use for the plentiful supply of low-cost power available throughout the Province.

Low average costs, however, are by no means confined to domestic consumers. This will be evident from the accompanying diagram reproduced from the Thirty-First Annual Report of the Commission.

Cost to Ultimate Consumers

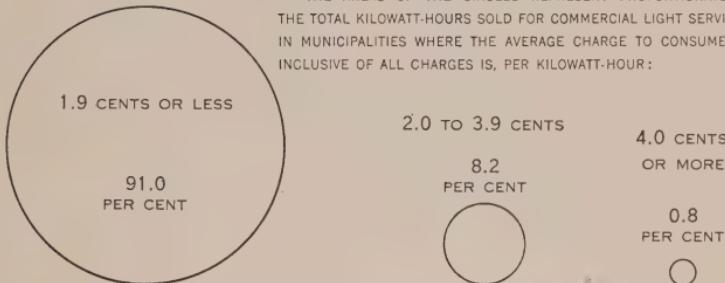
DOMESTIC SERVICE

THE AREAS OF THE CIRCLES REPRESENT PROPORTIONATELY THE TOTAL KILOWATT-HOURS SOLD FOR DOMESTIC SERVICE IN MUNICIPALITIES WHERE THE AVERAGE CHARGE TO CONSUMERS INCLUSIVE OF ALL CHARGES IS, PER KILOWATT-HOUR:



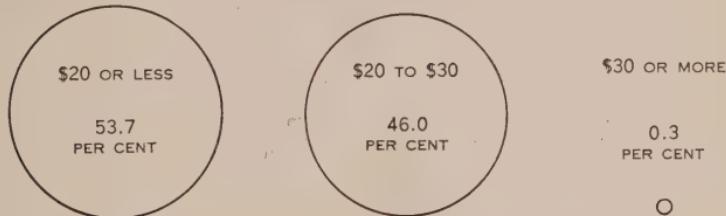
COMMERCIAL LIGHT SERVICE

THE AREAS OF THE CIRCLES REPRESENT PROPORTIONATELY THE TOTAL KILOWATT-HOURS SOLD FOR COMMERCIAL LIGHT SERVICE IN MUNICIPALITIES WHERE THE AVERAGE CHARGE TO CONSUMERS INCLUSIVE OF ALL CHARGES IS, PER KILOWATT-HOUR:



POWER SERVICE SUPPLIED BY MUNICIPALITIES

THE AREAS OF THE CIRCLES REPRESENT PROPORTIONATELY THE AGGREGATE HORSEPOWER SOLD FOR POWER SERVICE IN MUNICIPALITIES WHERE THE AVERAGE CHARGE TO CONSUMERS INCLUSIVE OF ALL CHARGES IS, PER HORSEPOWER PER YEAR:



This diagram depicts in graphical manner the remarkable economy of service enjoyed by citizens in the municipalities served by The Hydro-Electric Power Commission of Ontario. The statistics relating to "power service supplied by municipalities" cover mainly retail power service supplied to the smaller industrial consumers. In addition the Commission serves certain large power consumers direct.

Rural Electrical Service

RURAL electrical service has been studied by The Hydro-Electric Power Commission of Ontario since the earliest years of its existence, and remarkable progress has been made over the past eighteen years.

Based upon the co-operative investments made by the cities and towns, rural electrical service in Ontario starts with the favourable feature of its wholesale supply of power provided *at cost*, determined in a manner precisely the same as for the wholesale supplies for the larger cities and towns. In connection with distribution costs, however, the rural consumer receives special consideration. In this case the Province, in pursuance of its long established policy of assisting agriculture, assists extension of rural electrical service by a grant-in-aid amounting to 50 per cent of the capital cost of distribution facilities.

In the southern part of the Province there is an assessed area of approximately 40,000 square miles containing 22,000,000 acres of which 75 per cent is land cleared for agricultural purposes. The total rural population in this area exceeds 1,100,000. Within reasonable transmission distance of existing lines and stations more than 75,000 farms may be served. At the end of 1938 about two-thirds of these farms were receiving electrical service.

In the settled rural areas of Ontario, rural power districts are formed. Their boundaries are not arbitrary geographic limits, but each district covers an area which can economically be served from one or more points of supply. There are 178 operating rural power districts, and power is delivered to approximately 100,000 rural consumers situated in 400 townships and 100 police villages. They are served over networks of rural primary lines which aggregate more than 16,000 miles.

The total capital investment in distribution lines and equipment in rural power districts is about \$29,000,000, of which the Province has contributed in the form of grants about one-half, thus relieving the districts of the interest and sinking fund charges for one-half the investment in distribution facilities, or about one-sixth of the total yearly cost of operation including the cost of wholesale power.



When Hydro comes to Rural Ontario it brings the opportunity for better living and increased happiness—through the utilization of modern electrically-operated appliances.



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